in the colony, Prof. Liversidge said that notwithstanding the liberality of Parliament and the receipt of private endowments for improved instruction in science, many of the arrangements for this purpose of the Sydney University are of a very meagre and imperfect character. The Board of Technical Education is now doing good work in spreading elementary, scientific, and technical education over the colony by means of science classes and itinerant lecturers. The necessity of scientific education is also being recognised; there is a motion before the Legislative Assembly to place the sum of 10,000*l.* upon the estimates for the establishment of schools of mines in the various mining centres, while another motion to be brought proposes to make provision for the creation and endowment of twenty scholarships of the value of 200*l.* per annum, each tenable for three years, at the Sydney University. The President then referred to Prof. Huxley's remarks in his anniversary address to the Royal Society on scientific federation. Prof. Huxley said:—"I have often ventured to dream that the Royal Society might associate itself in some special way with all English-speaking men of science; that it might recognise their work in other ways than by the rare opportunities at present offered by election to our foreign fellowship, while they must needs be deprived of part of its privileges." On this Prof. Liversidge remarks that though every one will agree as to the desirability of having closer bonds of union between the Royal Society and the men of science who are scattered over the wide areas of English-speaking countries, it does not appear easy to suggest a method of bringing it about. Good work in the Colonies, at any rate at present, is rarely overlooked by the Council of the Royal Society. Prof. Liversidge concluded his interesting address by suggesting a federation or union of the members of the various scientific societies in Australia, Tasmania, and New Zealand into an Australasian Association for the Advancement of Science, on the lines of the British Association, with a view to holding the first general meeting in Sydney on the hundredth anniversary of the founding of the colony. A meeting of the kind during the centennial year would offer a unique opportunity for the exchange of ideas and information, and it would not only have an immediate and beneficial effect, but would permanently raise the high-water mark of thought in all the colonies, especially in connection with scientific matters. It would be an opportunity to correlate and correct all the scattered and fragmentary geological maps and memoirs relating to the various colonies, and to adopt a uniform system of nomenclature, colouring, &c., for all Australasian geological maps. It would, pursued the President, be beneficial if botanists were to prepare and revise the census of plants for each colony, especially to show their distribution, and similar questions could be discussed by zoologists for land and marine organisms.

ICE MOVEMENTS IN HUDSON'S BAY[1]

IN my report last year I described the ice as consisting of three kinds, viz., icebergs, heavy arctic ice and ordinary field ice. The icebergs are stated to have come from Fox Channel. This conclusion was based on the report from No. 3 station made on the homeward voyage of the *Neptune*, that the icebergs passed the bluff from west towards east. This report was made on the strength of the few observations which the party had been able to make in the interval between the two calls of the *Neptune* at the inlet. Further and more perfect observations show conclusively that the current sets in the opposite direction and that the icebergs move from east to west. If further proof of the existence of this set were necessary, we have it in the drift of the *Alert* when fast in the ice off Ashe Inlet and invariably carried to the westward.

In considering the question of the sources from which the ice affecting Hudson's Straits navigation comes, we must first begin with the east Greenland ice. All those who have made the voyage from any port in Europe to Hudson's Straits seem to agree in the statement that Cape Farewell must not be approached nearer than seventy miles in order to keep clear of the east Greenland ice which sweeps round the cape in an almost ceaseless stream, after rounding which it turns to the northward, and passes up the south-west shore of Greenland, nearly as high as Gothaab, then turns over to the west side of Davis' Straits, and joining the stream of Davis' Straits ice runs south with the arctic current. The limits of the east Greenland ice field, when rounding Cape Farewell, vary greatly; in some years, it moves as far south as the parallel of 58° N. This ice field can be, and is of course always avoided, the rule in making the passage being to keep to the south of 58° N. till in longtitude 58° W., on which meridian the northing should be made.

The stream of Davis' Straits ice flows right across the entrance to Hudson's Straits, and varies in width with the season of the year. The first information which I have of it was derived from conversation with Captain Watson, of the whaling barque *Maude* of Dundee, owned by Captain Adams. Captain Watson had been for many years engaged in the Davis' Straits whale fishing, and for the last few years has commanded his present vessel. Their usual routine is to leave Dundee in March, and they arrive off the edge of Davis' Straits ice in the early part of April, cruising off the edge of the ice between latitudes 58° N. and 63° N. Captain Watson told me, that he made the ice in April of this year about 58° N. and 120 miles off the Labrador coast, and up to the date of our meeting with him, June 13, he had not been able to get nearer to Resolution Island than thirty-five miles, and as the average southerly set of the current is about twenty miles per day, this stream of ice must have been flowing uninterruptedly up to June 15, the date on which the *Alert* took the pack. An examination of the records of the stations at Port Burwell and Nachvak Bay shows that at Port Burwell the ice cleared out of the Straits on April 9. They remained clear up to the 14th, when the ice came in sight again, and was present almost constantly thereafter until its final disappearance in August. At Nachvak the ice swung on and off the shore with the winds and tide, but though sometimes out of sight from the ordinary observation point, it was always seen upon going to a higher elevation. It is therefore certain that during the months of May, June, and July, large fields of ice were present in the entrance of the Straits, and the question remains, at what date was this ice in such a condition as to permit the passage of vessels strengthened for meeting the ice, but which could be used as freight steamers. For in all questions as to feasibility of the navigation I am not considering the date at which one of the Dundee whaling or Newfoundland sealing steamers could be forced through, but when a strongly built iron steamer, sheathed and otherwise strengthened, could make the passage.

On June 15, when we went into the ice, it was certainly impenetrable by any vessel of the class referred to, and though the ice would slacken at the turn of every tide, and sometimes run abroad so that it would have been possible to work the ship to the westward, distances varying from two to five miles at each of these slack times, I only tried to hold my own, generally under canvas; as apart from any question of the injury which the ship had received, I deemed it more desirable to watch the ice at the entrance of the Straits than to force the ship through, when I could only have made at the most ten to twenty miles a day. I am of opinion that the Straits were passable at the eastern entrance about the date that we returned to St. John's for repairs, viz., July 5, but any ship going in at this date would still have been subject to these delays, but might have made from twenty-five to forty miles a day.

Proceeding westward, from this date, July 5, the observations at Ashe Inlet and Stupart's Bay show that on the north side of the Straits, and from eighteen to twenty miles out, the ice was present almost continuously, much as we found it in August; some of the sheets of enormous extent and of great thickness. Many of these were, in August, over half a mile long, and some which we measured were from twenty to thirty feet in thickness. In the middle of July, Mr. Ashe reports that open water is visible beyond the ice, and Mr. Stupart, fog-banks and water sky frequently to the north. The two stations at the western end of the Straits also report that in the middle of July the ice was loose and drifting with the tide. Everything goes to show that though there would have been very frequent delays still it would have been possible for a steamship to have got through the Straits by July 15 or 20.

Ice would have been met with again, doubtless, in the bay, but I do not think there would have been any serious delay in reaching either Churchill or York Factory.

Stations on shore for the purpose of watching the movements of the ice, though undoubtedly the best system which we can adopt, cannot tell us with any degree of certainty how soon a vessel might be able to push her way through the Straits, but they do tell when it is sufficiently run abroad, or

[1] From the Report of the second Hudson's Bay Expedition under the command of Lieut. A. R. Gordon, R.N., 1885.

when a sufficient amount of open water appears, to make the passage a reasonable certainty, and the date for this year I place at from July 5 to 15, as it is more than likely that a ship could have got through the Straits in ten days. The ice is, moreover, so sensitive to wind that even if telegraph stations were so placed as to be able to convey to ships news regarding the position of the ice ahead, long before the ves el arrived at the place the condition of affairs might, and probably would, be totally changed.

As to the closing of navigation in 1884, Mr. Laperrière reports, at Cape Digges, that on October 25 the ice was solid in every direction, and at Nottingham Island a similar entry is made on the 27th. A distinction must be made between the closing of navigation by the formation of young ice, and the presence of a large field of heavy old ice which is cemented together by the formation of young ice between the pans. In the first case any ordinarily powerful steamer could go through without risk, but in the second case the most powerful of the whaling or sealing steamers would be helpless. The western end of the Straits is always subject to incursions of this heavy ice, from Fox Channel, and especially so in the months of September and October, when strong north-easterly and north-westerly gales are frequent, and we have now evidence that in both seasons, 1884 and 1885, this heavy ice came down in October.

As to the length of season for practical navigation, if we regard the presence of field ice as the only barrier, the information which we have got would point to the months of July, August, September, and October as being the months in which the Straits are passable. As a rule, in July there will be delays, but to vessels strengthened and sheathed there would be no danger in making the passage.

All the inhabitants of the Labrador, the Straits, and the Bay, spoken to on the subject, agreed in stating that the ice movements this year were much later than the average; at Fort Churchill the season was fully a month late, and on the Labrador three weeks, so that I think it will be found that on the average four months will be the length of the season for practical navigation by steam vessels which would be freight-carriers. There have been, I am informed, seasons when the Straits were clear of ice in the month of June, but they are, according to the logs of the Hudson's Bay ships, quite exceptional. Captain Hawes spoke of such being the case only once in his experience of fourteen years, and the dates which I have seen of the arrival of the Hudson's Bay vessels at their ports of destination show no arrival earlier than August.

THE TRANSCASPIAN FAUNA

WE notice in one of the last issues of the *Bulletin* of the Moscow Society of Naturalists (1885, No. 2) a most valuable paper, by M. Zaroudnoi, on the birds of the Transcaspian region. His list contains an enumeration of 184 species, well determined on 600 specimens—doubts remaining only with regard to a very few species. The author distinguishes in the region the following chief zoological sub-regions:—(1) The Kara-kum desert, having a pretty well furnished flora, notwithstanding its immense sandy plains and salt clays. The Tamarix forests, now mostly destroyed, are well peopled with the *Atraphornis aralensis*, as also with a few *Podoces* (*Panderi?*) and *Passer* (*ammodendri?*), which make their nests further north in the *saksaul* forests. The *Houbara quennii*, Gray, is rare. The reptiles are represented by the *Phrynocephalus interscapularis* and *helioscopus*, *Agama sanguinolenta*, *Testudo*, *Naja oxiana*, Eichwald; the *Varanus sciucus* extends much further south into the Akhal-Tekke plain, and even to the Kopet-dagh Mountains. (2) The Akhal-Tekke oasis, striking by the monotony of its landscape, diversified only by the gardens of the Tekkes, which remain green even during the hottest part of the summer, when all vegetation is scorched up by the sun. In the plain only the Tamarix, a few willows on the banks of the rivulets, and the dark-green bushes of the capers, adorned with pretty flowers, are to be seen. The great areas covered with bushes of *Alchagi camelorum* and wormwood increase the monotony of the landscape. Pretty *Julodis variolarius*, *eufraticus*, and sometimes *globicollis* are often found flying around these bushes; in July the *Fisheria baetica*, Ramb., several Irises, as also *Empus pennicornis*, Pall., several kinds of *Ateuchus* and *Copris*, and numerous species of *Melanozomatæ* are met with. The stone-chatters (traquets) and larks are so numerous as to become troublesome. The *Phrynocephalus helioscopus* and *Agama sanguinolenta* fly at the approach of man. From time to time a *dscheiran*, or a fox, may be perceived. The nights are sultry and hot, and one hears the shrivelling of the *Grillus cerisyi*, Serv., and *G. capensis*, Fabr., the barking of the jackals, and the cries of *Caprimulgus arenicolor*, Sev. The banks of the few rivers, covered with brush and reed-grass, are the refuge of the wild cat and the *Lagomys*. The high summer temperature of the oasis is well known: 40° Cels. in the shade being not uncommon; and M. Zaroudnoi is inclined to ascribe to the great heat the intensity of the moulting of birds. The lark loses so much of its feathers that the body remains in many parts quite naked; with the stone-chatters only the base of the feathers remains on their heads. Most of the birds met with in the oasis during the summer belong to the Aral-Caspian fauna, the others come from the mountains; these last have followed the courses of the rivers and have taken possession of the Akhal-Tekke gardens; such are the *Salicipasser montanus*, *Passer indicus*, *Sylvia mystacea*, *Butalis grisola*, a great number of *Salicicariæ*, and several others. Some, like the griffons, the ravens, the *Cypselus apus*, the *Chelidon urbica*, the *Merops apiaster*, inhabit the mountains, and descend to the plain only for hunting. The *Galerita magna*, *Calandrella pispoleta*, and *Saxicola isabellina*, may be considered as representatives of the Akhal-Tekke fauna owing to their considerable numbers. (3) The mountain-region is much more interesting, especially when the traveller reaches the upper valleys covered with forests, where the vines grow wild. Wild cats and jackals are the usual inhabitants of these valleys; but the *Cynailurus jubatus* and the *Leopardus pardus* are rare; *L. irbis* is never met with in the region. *Hyæna striata* is occasionally met with. *Ellobis talpinus*, several *Erinaceus* and *Platycercomys*, as also *Histrix hirsutirostrix* are common. The dreadful *Vipera eufratica* is a source of continual danger during the grape-harvest. *Eremias velox* and *Agama sanguinolenta* are worthy of notice. As to the birds, we must merely refer to the list of M. Zaroudnoi, where notes as to their distribution are given in French. The zoological determinations have been revised by M. Menzbier.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, May 27.—"Researches in Stellar Photography." By the Rev. Prof. Pritchard, F.R.S.

The objects of these researches are:—(1) To ascertain, if possible, by means of definite and accurate measurement, as distinguished from impressions and estimates, what is the relation between the diameter of a star-disk impressed on a photographic plate with a given exposure, and its photometric magnitude, instrumentally determined. With this view, five plates of the Pleiades were taken with different exposures, on different nights. The diameters of the star-disks on each of the plates were then measured with a double-image micrometer, checked by measurement also with the macro-micrometer in the Oxford University Observatory. Curves were then drawn for each of the plates, taking the magnitudes as given in the "Uranometria Nova Oxoniensis" as abscissæ, and the measured diameters as ordinates. The result was a satisfactory coincidence in the case of all the plates, leading, when treated in the usual manner, to the final result—

$$D - D' = \delta \{\log M' - \log M\} \quad . \quad . \quad . \quad (1)$$

where D, D' are the measured diameters of any two stars on the plate, and M, M' the corresponding photometric magnitudes; δ being a definite constant depending on the physical circumstances of the particular plate.

It was observable that, out of twenty-eight stars examined, three stood out from the rest, indicating, as might have been expected, some peculiarity in the spectra of these stars. In the memoir itself the tabular relations of all the measures are exhibited. The similarity of the symbolical form above to the relations existing between "magnitude" and intensity of light is obvious and interesting.

(2) Another branch of the inquiry is still more important, and it is this. Seeing that in the modern use of the dry plates the times of exposure are so considerable, and the processes of development and drying, &c., so suspiciously dangerous to the stability of the films, it becomes a matter of great importance to ascertain